NEW WEST AFRICAN CERATOPOGONINAE

BY

HENRY F. CARTER

LECTURER IN ENTOMOLOGY, LIVERPOOL SCHOOL OF TROPICAL MEDICINE

(*Received for publication* 20 *November*, 1918)

PLATE VIII

The small or minute Chironomid flies forming the sub-family Ceratopogoninae are of considerable economic interest, as a number of species are known to suck blood. They are found in almost all parts of the world, and in some localities, which are by no means limited to tropical or sub-tropical regions, they are most troublesome and persistent in their attacks on man. Comparatively little is yet known of the Ethiopian fauna, few species have been described, and, so far as I am aware, no information regarding the early stages of any species from this region has hitherto been published. Particular interest, therefore, attaches to the species of *Forcipomyia* described below, the larvae of which were found and reared at Accra by Dr. Ingram, W.A.M.S., who also made careful observations on the early stages of this midge.* The information he supplied is given on page 297. The interest in the species is enhanced by the fact that, given favourable opportunities for attack, its larvae prey upon the larvae of mosquitoes breeding in rot-holes in trees. In West Africa the larvae of several species of *Stegomyia*, including those of the carrier of yellow fever (*S. fasciata*, Fabr.), commonly occur in such situations. The main food of these midge larvae is the organic débris floating on the surface or stranded at the sides of the rot-hole, and in all likelihood

* A short account of the early stages by Dr. Ingram has just appeared in the Medical and Sanitary Report of the Gold Coast for the year 1917. The insect is referred to as a species of *Ceratopogon*, sens. str.

includes also dead insects and larval and pupal exuviae.* It is most improbable that the *Forcipomyia* larvae could destroy active mosquito larvae, even although, as Dr. Ingram states, they swim freely. They rapidly destroy stranded larvae, however, and in nature, it is probable that they devour not only moribund larvae and pupae, but healthy pupae prior to eclosion and emerging adults. The food of the adult was not definitely ascertained, but is probably similar to that of the larva. Records of *Ceratopogoninae* attacking other insects are accumulating, and some members of the genus *Culicoides* are known to suck the juices of living mosquitoes. It is possible, therefore, that the imagines also may attack the mosquito fauna of the rot-holes, and that to some extent *Forcipomyia ingrami*, sp. n., in both its larval and adult stages, may act as one of the natural controls of these mosquitoes.

I desire to extend my sincere thanks to Dr. Ingram for giving me the opportunity of examining and describing this interesting little insect and for allowing me to make use of his notes. I also wish to thank Dr. G. A. K. Marshall, Director of the Imperial Bureau of Entomology, for his kindness in sending me examples of *F. castanea*, Walk., for comparative purposes.

The types and co-types of the two species herein described have been placed in the collection of the Liverpool School of Tropical Medicine.

Genus FORCIPOMYIA, Meig.

Forcipomyia ingrami, sp. n.

(Plate VIII, figs. 1-10)

A minute dark brown fly with yellowish scutellum, unicolorous wings and pale yellowish-brown legs.

LENGTH (two ♂s, two ♀s) ♂ 1·8 mm., ♀ 1·4 mm., length of wing, ♂ 1·2 mm., ♀ 1·1 mm.; length of antennae, ♂ 0·8 mm., ♀ 0·5 mm.

FEMALE: *Head* dark brown, the occipital region sparsely clothed with ochraceous hairs; clypeus prominent, bearing moderately long yellowish-brown hairs; eyes large, reniform, contiguous in the middle dorsal line. Proboscis about as long as the head, its component

* Pratt records the larvae of *Ceratopogon* (= *Culicoides*) *guttipennis*, Coq. feeding on dead mosquito and other insect larvae and upon cast larval and pupal skins.

organs, other than the labium, strongly chitinised and adapted for piercing; labium somewhat fleshy, pale brown in colour with sparsely arranged ochraceous hairs. Palpi (Plate VIII, fig. 10) yellowish-brown with pale hairs; each composed of five segments, the third segment elongate—more than twice the length of any other two segments taken together—and swollen on the inner lateral basal third; sensory organ in the swollen portion of the third segment communicating with the exterior by a relatively wide, deep circular pit containing numerous minute hairs. Antennae (Plate VIII, fig. 7) each composed of fifteen segments (including the reduced segment preceding the torus), testaceous, basal segments dark brown; segments three to ten spherical or oval, spherical at the base of the flagellum and gradually lengthening towards the tenth segment; eleventh to fourteenth segments cylindrical, each from two to three times as long as the greatest breadth; terminal segment larger and broader produced at the apex into a minute nipple-like process. Antennal hairs dark brown, arranged in whorls of ten on all but the last segment; segments eleven to fifteen with short pale hairs scattered over the surface. Delicate slightly curved spines occur on certain of the flagellum segments; they are present on at least all the segments up to and including the eighth* (= tenth antennal segment), and are arranged in two admedian pairs (one dorsal, one ventral) on the anterior third of the segments. *Thorax* dark brown, broad in front gradually narrowing towards the scutellum; clothed with golden-brown hairs, which are longer and more numerous posteriorly, and with scattered dark bristles on the margins. Scutellum paler in colour with numerous long golden-brown bristles. Pleurae rather paler than the disc. Post-scutellum dark chestnut-brown, nude. *Wings* (fig. 1) unicolorous, densely clothed with brown decumbent hairs which are darker and more numerous anteriorly. Costa, first and third longitudinal veins and basal portion of the fourth longitudinal vein thicker, darker and bearing longer hairs than the remaining veins. The two small cells or interspaces situated near the middle of the upper margin of the wing,

* Since writing the above further material has been received from Dr. Ingram. Spines occur on *all* the flagellum segments, but those on the last four segments are much smaller and more numerous than those on the basal segments and are scattered over the surface of each.

formed by fusion in the central region of the first and third longitudinal veins, are unequal in size and ill-defined; the proximal

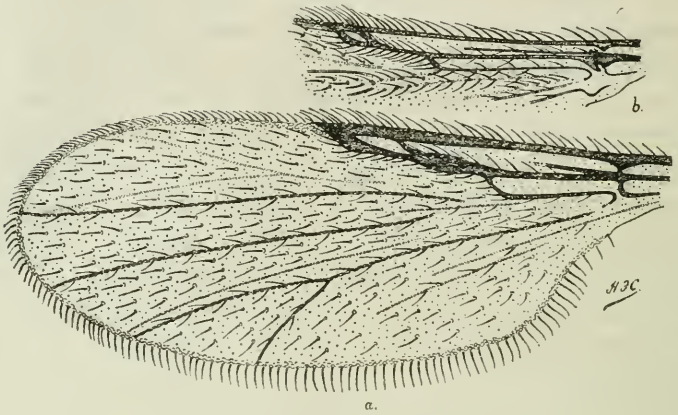

FIG. 1. *Forcipomyia ingrami*, sp. n.

a. Wing of female (× 75 circa); *b*. Upper basal portion of wing of male (× 65 circa). The hairs on the anterior portion of the wing, so far as the apical third, are much more numerous than is shown.

interspace is most minute, and is exceedingly difficult to distinguish. Rami of the fourth longitudinal vein very long, the base of the fork and the petiole obsolete. Halteres cream-coloured. *Legs* (fig. 2)

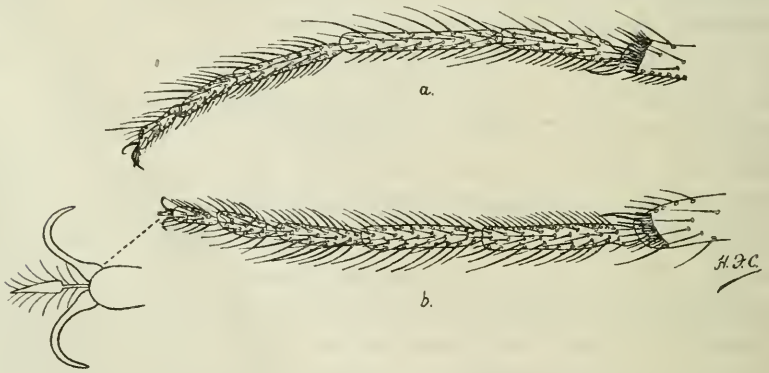

FIG. 2. *Forcipomyia ingrami*, sp. n.

a. Hind tarsus of male; *b*. Hind tarsus of female (× 110 circa).

yellowish-brown, somewhat thickly clothed with relatively long ochraceous hairs. Femora unarmed. Fore tibiae with apical ventral spurs; hind tibiae each with an apical spur and two obliquely-trans-

verse rows of bristles—the anterior row composed of seven rather coarse bristles, the posterior row of fourteen or fifteen shorter, finer ones. First tarsal segments of all legs approximately $1\frac{1}{3}$ times the length of the second segments. Claws well developed, simple. Empodium hairy, nearly as long as the claws. *Abdomen*: dorsum slightly darker than the thorax clothed with yellowish hairs which are longer at the sides and apex; cerci hairy and about half as long as the terminal segment. Venter yellowish-grey. Spermathecae two, strongly chitinised, spherical.

MALE: Less robust in build than the female and differing as follows:—*Head*: third segment of palpus (Plate VIII, fig. 9) less swollen basally, the sensory cup containing but few (apparently three or four) relatively short stout hairs which are dilated at their apices. Antennae (Plate VIII, fig. 8) longer, plumose; tori very large sub-spherical; basal portion of third segment (i.e. first flagellum segment) elongate, cylindrical, apical portion dilated bearing a whorl of ten relatively short hairs; segments four to eleven inclusive spherical or sub-spherical, each with hairs (thirty to forty in number) arranged in a median transverse whorl; twelfth segment greatly elongated, the basal portion smaller but resembling that of the preceding segments in form, the apical portion very long and narrow, cylindrical; thirteenth and fourteenth segments somewhat similar in shape to the twelfth segment, but only about half as long; terminal segment broad and flattened without a distinct whorl of hairs; last four segments, taken together, almost equal to the combined lengths of the first nine flagella segments. *Wings* (fig. 1) longer, narrower and less densely clothed with hairs than in ♀; first and third longitudinal veins separating immediately before the costa and forming with that vein a single small cell. *Legs* (fig 2) rather paler than in ♀; first tarsal segments of the fore and middle legs slightly longer than the second segments; hind metatarsi each approximately three-quarters the length of the following tarsal segment. *Abdomen* more slender than that of the ♀, and more densely clothed (particularly on the apical segments) with longer hairs.

MALE HYPOPYGIUM (fig 3). Side pieces short bearing numerous very long coarse hairs on both dorsal and ventral surfaces; inner margin convex with a somewhat prominent hair or bristle

arising near the middle. Basal lobes of side pieces well developed, each with four or five short strong hairs arising from the apical margin and a shorter spine-like hair near the middle of the inner margin. Terminal clasp segment stout, rather more than two-thirds the length of the side piece; dorsal surface depressed at the apex which is shallow and spoon-like. Penis sheath broad at the base, narrowing to a bluntly rounded apex but slightly constricted just before the distal extremity.

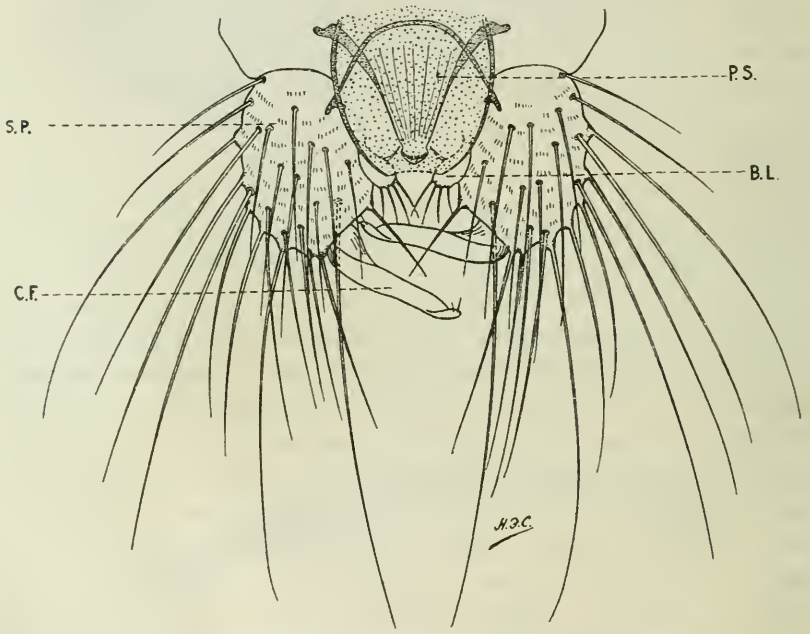

Fig. 3. *Forcipomyia ingrami*, sp. n.

Male hypopygium, ventral view (× 240 circa). s.p., side piece; c.f., clasp filament; b.l., basal lobe of side piece; p.s., penis sheath.

Larva (Plate VIII, figs. 1-4). *Length* 2·5 mm. to 3·0 mm. A creamy white, eucephalus, fleshy-bodied, bristly creature, with pseudopods on the first and last segments. *Head* strongly chitinised, more or less conical in form, without distinct eye spots and bearing a number of hairs and spines as shown in the figure. Antennae in the form of simple uni-segmented curved pointed processes arising from narrowly separated tubercles situated on the vertex. Mandibles powerful, each armed with a number (apparently

fourteen) of strong chitinous teeth and a few relatively long basal spinous processes. *Body* composed of twelve visible segments, each with an armature of bristles or spines, as follows:—A pair of tuberculate, spear-shaped, admedian dorsal spines, a pair of small, curved, tuberculate, hairy dorso-lateral spines, four relatively stout bristles on each side and a pair of minute bifurcate or trifurcate sub-ventral hairs. The dorsal spear-like spines are most conspicuous, and are possibly characteristic; excluding the tubercular base, each consists of a narrow proximal portion and a broad blade-like distal portion, the two portions being more or less equal in length, except in the anal pair, which are very long owing to great extension of pedicle. The pair of spines on the first segment are somewhat rudimentary, and are very similar in size and shape to the cephalic pair which are situated a short distance behind the antennae. The posterior extremity of the twelfth segment is produced sub-dorsally into a relatively large papilla, which bears a pair of small branched hairs and a pair of simple hairs—the latter arising from cylindrical tubercles; medially this portion of the segment is extended into a large semi-membranous triangular process, the sides of which are fringed with short hairs; immediately below this process are two pairs of small gills. Each pair of pseudopods is fused into a single organ, but coalition of the anal pair would seem to be less complete than that of the pro-thoracic pair, as the armature of hooks is interrupted in the middle line. The anal pseudopod occupies the whole of the ventral extremity of the twelfth segment, which is evidently capable of invagination to a considerable extent (c.f. Plate VIII, figs. 2 and 3). When extended the apical ventral margin of this segment is seen to be covered with numerous minute teeth or spines surmounted by two more or less distinct groups of strong chitinous hooks. The latter are arranged in a double row, those forming the more ventral series being smaller and numbering five in each group, while the upper row consists of considerably larger hooks arranged in two sets of four hooks each.

Pupa (Plate VIII, fig. 5). *Length* 3·0 mm. This stage of the insect is slightly darker in colour than the larva (judging by the preserved specimens), and possesses a distinctly granular integument. Its armature of spines and bristles is very weak, and it is apparently entirely free of the larval skin since no trace of exuviae

can be detected on the distal segments of the specimens available. The respiratory trumpets (Plate VIII, fig. 6) are beautiful though complex structures, and their form and external morphology may best be appreciated by examining the figure. The *thorax* bears a number of tubercles (particularly on the dorsal surface) and is extended posteriorly over the middle of the first abdominal segment in the form of a relatively large, conical papilla. The thoracic tubercles are arranged as follows:—Three small granular dorso-admedian tubercles and two larger smooth ventral ones on the anterior margin; three small antero-dorso-median tubercles arranged in the form of a backwardly-directed triangle; two large conical bristle-bearing tubercles posterior to the air-trumpets; a lateral pair situated slightly behind the last-named tubercles; a pair at the base and a very small pair near the middle of the papilla-like extension of the thorax. *Abdomen* broad at the base, gradually narrowing towards the apex, with minute tuberculate bristles at the sides and a pair of minute admedian hairs on each segment. The ninth segment is elongate, and is produced into two long, pointed, finger-like processes, each of which bears at its base a small dorsal rumule.

HABITAT: Accra, Gold Coast, 1918. Dr. A. Ingram.

This little midge, which I have much pleasure in associating with its discoverer, does not appear to be closely related to any members of the genus *Forcipomyia* yet described from the Ethiopian region. Four species* of *Forcipomyia*, known from females only, occur in West Africa, and in this sex it may readily be distinguished from all of these—except *F. lefanui*, Carter—by the metatarsi of the hind legs being longer than the second tarsal segments. *F. lefanui* is a smaller and darker insect, and the hind metatarsi are relatively much longer than in *F. ingrami;* but the most obvious differential characters perhaps are those supplied by the neuration of the wings. In *F. lefanui* the distal extremity of the third longitudinal vein is narrowly separated from, and extends for some distance more or less parallel to, the costa and joins the anterior margin of the wing near the apical third, whereas in *F. ingrami* the distal portion of the third vein is short and joins the anterior margin near the middle. Two species—*F. tavetae* and

* *F. castanea*, Walk., *F. incomptifeminibus*, Aust., *F. inornatipennis*, Aust., and *F. lefanui*, Carter.

F. tangae—described by Kieffer from East Africa, also have the hind metatarsi longer than the second tarsal segments, but from these *F. ingrami* apparently differs considerably in its general facies and wing venation.

Dr. Ingram's observations on the early stages of this insect are of considerable value and interest, as will be gathered from the following information which he has supplied.

The *Forcipomyia* larvae were first noticed by Dr. Ingram while carrying out experiments with the larvae of *Stegomyia fasciata*, Fabr. The conditions under which the experiments were conducted were such that it was necessary to protect the larvae against the ravages of ants, spiders, etc., but in spite of various precautions being taken, the mosquito larvae disappeared. Ultimately Dr. Ingram found that they were 'being eaten by some small and active larvae with black heads. Five or six of these larvae quickly pulled a stranded *S. fasciata* larva to pieces—they appeared to feed upon any organic material they came across and paid special attention to the *S. fasciata* larvae when they were motionless . . . ' The *Forcipomyia* larvae are not strictly aquatic, for although they swim admirably they do not seem to like water and prefer wandering about just above the water-line. 'Upon flooding the surface . . . with water to the depth of half an inch they immediately made for the sides of the receptacle and crawled above the water-line, remaining there till all the water had drained away. Apparently their usual breeding places are rot-holes in trees, as I have found them immediately after moistening the débris scraped out of rot-holes in Flamboyant trees.' In the laboratory, however, Dr. Ingram never observed them until his experiments had continued for two or three weeks—that is until a considerable amount of organic material had accumulated from the occasional emptying of jars containing *S. fasciata* larvae. 'The pupae are very inert, and were usually adherent to the sides of the receptacle above the water-line; when the depth of the water was increased so as to submerge them they became detached and showed feeble movements in the water. The larval stage seems to vary in duration with the amount of food supply; the pupal stage lasts about thirty-six hours.' Dr. Ingram states that up to the present he has been unable to discover the eggs of this little fly.

Genus Culicoides, Latr.

Culicoides ochrothorax, sp. n.

A small dark brownish-grey midge with bright ochraceous mesonotum and spotted wings; fore and middle legs with a conspicuous broad pale band enveloping the femoro-tibial joint, hind tibiae entirely ochraceous, fore tarsi brownish, middle and hind tarsi ochraceous.

Length (one specimen) 1·4 mm.; length of wing 1·1 mm.; length of antennae 0·7 mm.

Female. *Head* dark brown or brownish-grey with dark hairs; clypeus shining dark reddish-brown, hairy; eyes black, narrowly separated dorsally. Proboscis about as long as the head, the labium pale with yellowish hairs. Palpi pale brown, densely clothed with brownish hairs; last two segments somewhat geniculate, third segment relatively broad and apparently of peculiar structure. This segment seems to be partially divided—from the apex almost to the base—and bears apically and laterally a number of minute modified hairs, each of which resembles a soup-ladle in miniature. Second segment long and narrow, rather longer than the third; fourth and fifth segments short, their combined lengths almost equal to that of the second. *Antennae*: Torus dark brown with a few short hairs; flagellum, except the last two or three segments which are somewhat testaceous, paler brown with whorls of yellowish-brown hairs. Flagellum segments elongate-ovoid about two and a half times as long as the greatest width, gradually becoming narrower, longer and more cylindrical towards the apex of the antenna; last segment broader than the preceding segment, somewhat flattened and terminating in a small, hairy styliform process. The antennae are provided with short straight spines—difficult to see—which can only be detected with certainty, in the limited material available, on the seventh segment. *Thorax*: Dorsal surface bright ochraceous with two small grey shoulder spots, a greyish-ochraceous median line extending from the anterior margin to the middle of the scutum and a relatively broad greyish-ochraceous median stripe extending from the posterior extremity of the median line to the scutellum. Dorsum sparsely clothed with brown and yellowish-brown hairs. Scutellum brownish-grey, becoming somewhat ochraceous near the centre of the

posterior margin, bearing three long yellowish-brown border bristles. Post-scutellum dark brown, nude. Pleurae ochraceous above, dark brown below, the two colours sharply separated along the middle line. *Wings* (fig. 4) brownish-grey, darker along the anterior border, with two relatively large white spots anteriorly—one covering the apex of the third longitudinal vein, the other covering the junction of the third and first longitudinal veins and the radio-medial cross vein. The apex of the wing is narrowly pale. Three other pale spots are present, but are smaller and much less conspicuous than the two costal spots mentioned above. Two of these are situated on the posterior border of the wing, one between the branches on the fifth longitudinal vein, the other immediately

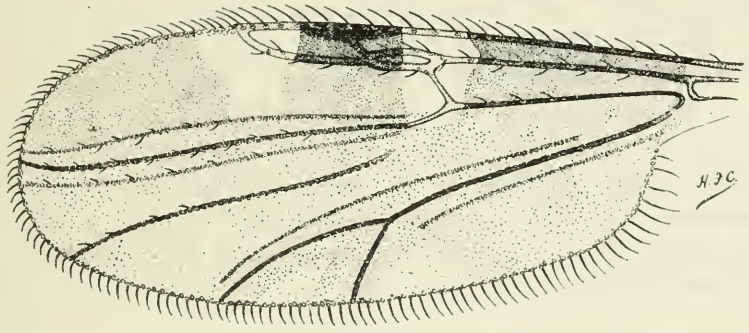

Fig. 4. *Culicoides ochrothorax*, sp. n.
Wing of female (× 75 circa).

behind the lower branch; they are ill-defined and can scarcely be distinguished when held at certain angles. The remaining pale area embraces the extreme base of the wing. Venation as shown in the figure, the small cells formed by the first and third veins distinct, the distal cell large and widely open. Extreme base of lower branch of fourth vein obsolete. Wings completely covered with minute upright setae; longer hairs only present on the thicker veins situated near the anterior margin, and on some of the veins and folds near the apex. Halteres cream coloured. *Legs*: Fore and middle femora dark brown basally, ochraceous apically, the latter colour occupying one-third and one-half the length of the respective limbs; hind femora dark brown. Fore and middle tibiae

ochraceous basally, dark brown apically, the former colour occupying one-third and one-half the length of the respective limbs; hind tibiae ochraceous. Fore tibiae each armed with a short stout ventral spine at the distal extremity; middle tibiae unarmed; hind tibiae each with a short blunt spur and two transverse rows of bristles apically—the distal row composed of four relatively long stout bristles, the inner or proximal row of about twenty much shorter, finer bristles. Fore tarsi pale brown, middle and hind tarsi ochraceous, metatarsi of the fore and middle legs each three to four times the length of the following segment, hind metatarsi each about twice the length of the second tarsal segment. Claws simple and equal. Empodium minute, less than half the length of the claws. *Abdomen* dark brown, the basal segments with narrowly pale hind margins, clothed with short dark hairs. Ventral surface slightly paler than the dorsum. Cerci yellowish.

HABITAT: Ashanti, Gold Coast, 1913, Dr. H. F. Hamilton.

C. ochrothorax is a well-marked species, and may be readily distinguished from its known African congeners, if not from all other known members of the genus, by the coloration of the mesonotum. The type and sole example was included in a small collection of *C. grahamii*, Aust., forwarded by Dr. Hamilton; all specimens bore the same data.

REFERENCES

AUSTEN, E. E. (1912). Notes on African Blood-Sucking Midges (Family *Chironomidae*, Subfamily *Ceratopogoninae*), with descriptions of new species. *Bull. Ent. Res.*, Vol. III, Pt. I, pp. 99-108.

CARTER, H. F. (1916). On Three New African Midges. *Ann. Trop. Med. & Parasitol.*, Vol. X, pp. 131-138.

INGRAM, A. (1918). Government of the Gold Coast, Medical and Sanitary Report for the year 1917. Appendix B.—Accra Laboratory Report, 1917. Appendix IV, p. 51.

KIEFFER, J. J. (1913). Voyage de Ch. Alluaud et H. Jeannel en Afrique Orientale (1911-1912). Insectes Diptères I. *Chironomidae* and *Cecidomyidae*. Paris.

PRATT, F. C. (1907). Notes on 'Punkies.' *U.S. Dept. Agric. Bur. of Ent. Bull.* No. 64, Pt. III.

EXPLANATION OF PLATE

Forcipomyia ingrami, sp. n.

Fig. 1. Head and first thoracic segment of larva (× 120 circa).

Fig. 2. Anal extremity of larva with posterior pseudopod retracted (× 120 circa).

Fig. 3. Anal extremity of larva, ventral view, showing pseudopod exerted (× 120 circa).

Fig. 4. Mandible of larva (× 370 circa).

Fig. 5. Pupa, dorsal view (× 25 circa).

Fig. 6. Respiratory trumpet of pupa (× 185 circa).

Fig. 7. Antenna of female (small basal segment not shown) (× 120 circa).

Fig. 8. Antenna of male (small basal segment not shown). (× 120 circa).

Fig. 9. Male palpus (× 185 circa).

Fig. 10. Female palpus (× 185 circa).


2.
1.
3.
4.
6.
5.
7.
8.
9.
10.